UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

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DEC 21 1993

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4WD-RCRA

TECHNICAL REVIEW MEMORANDUM

SUBJECT: Olin Corporation/McIntosh Plant
Clean Closure Equivalency Demonstration
EPA ID No. ALD 008 188 708
Superfund Account No. TGB04D6B6

FROM: Lael H. Butler 931221
AL/MS Unit, RCRA Permitting Section

TO: Kenneth A. Lucas
Remedial Project Manager
South Superfund Remedial Branch

THRU: Beverly F. Williams, Chief
AL/MS Unit, RCRA Permitting Section

The Clean Closure Equivalency Demonstration was required by EPA's letter of May 25, 1993 and submitted in accordance with Attachment 1 of the Administrative Order By Consent For Remedial Investigation Feasibility Study (May 7, 1990).

Background[1]

There is wide-spread groundwater contamination beneath the Olin site from past releases of process and waste units. Several units subject to RCRA regulation have closed and a corrective action program was initiated. Five groundwater recovery wells currently operate to control the further migration of contaminated groundwater. The two main constituents of concern are mercury and chloroform.

Nine solid waste management units (SWMUs) were [previously] closed according to the interim status requirements, 40 CFR 265. However, the 40 CFR 170.1(c) regulations for surface impoundments, landfills, treatment units, and waste piles state that if any of these were clean-closed under 40 CFR 265, they are subject to the clean closure equivalency standards, 40 CFR 264. At the Olin McIntosh facility, these include:

- the Stormwater Pond,

[1] Summarized from the Clean Closure Equivalency Demonstration Report.

- the Brine Filter Backwash Pond,
- the Pollution Abatement (pH) Pond, and
- the Mercury Waste Pile Storage Pad.

The closure procedures for each SWMU are described in Section 3.1 of the referenced report and will not be reiterated.

Soil Sampling

Soil samples were collected August 14 - September 1992 according to the approved Phase III Remedial Investigation/Feasibility Study (RI/FS). The reader is referred to the June 25, 1992 Phase III Sampling and Analysis Plan for soil sampling protocol. Table 3-1 (attached) summarizes the samples collected.

The three surface impoundments are currently active or in standby service as nonhazardous units and have either recompacted clay or synthetic liners. Sampling directly through the ponds could have comprised the liner integrity and therefore, the samples were collected adjacent to the units.

The mercury waste pile storage pad has been completely removed. The only remaining structure is a concrete slab. Drilling through the slab was attempted but reinforcement bars impeded drill bit advancement. A hand auger boring was completed to the southeast of the slab.

Tables 3-5 through 3-8 contain the soil sample results for each unit.

Potential Impacts

As part of the clean closure equivalency, Olin is required to document that any contaminants left in the subsurface soils will not impact surface water, groundwater, or the atmosphere. To this end, Olin used a reported soil sample concentration of 2.0 μg/kg, for chloroform[2], and calculated a pore water concentration value of 11.1 μg/l. Olin reports that this value is much less than the Maximum Contaminant Level (MCL) of 100 μg/l. Also, Olin states that the actual pore water concentration may be even less due to adsorption to the soil and dilution from downwater percolating water.

[2] Chloroform was the only organic constituent reported in the soil samples from the surface impoundments. Olin reports that mercury was detected at the quantitation limit of 0.11 mg/kg.

At the Mercury Waste Pile Storage Pad, lead and mercury were detected in the soil samples. Olin reports that the lead concentration of 11.3 mg/kg is well within the 2 - 200 mg/kg common range for naturally occurring lead in soil. Mercury was detected in one sample at 1.1 mg/kg. Calculations to determine potential leachate concentration and the adsorption factor are provided; the results imply that based on this analysis, 0.0125 mg/l or 12.5 μg/l mercury in the leachate would be generated from 1.1 mg/kg mercury in the soil.

The assumption is that leachate would infiltrate the Alluvial Aquifer at 12.5 μg/l and then mix with the groundwater (it was assumed that there would be no attenuation in the approximate 20 feet of unsaturated zone above the Alluvial Aquifer). Then based on a calculated percolation rate for rainwater and the horizontal groundwater flow rates, the concentration of mercury would be 0.09 μg/l -- well below the MCL of 2.0 μg/l.

Conclusions and Recommendations

Olin is a large facility which has operated for approximately thirty-seven (37) years. During this time, events occurred which caused contamination of the various environmental media (groundwater, soil, etc.). State and federal regulations dictate that the extent of contamination and rate of movement must be determined. Olin has cooperated with these regulations and has an active groundwater recovery and treatment system. However, due to a change in closure equivalency regulations, Olin was required to demonstrate that several units which previously closed (according to 40 CFR 264) had indeed closed under the more stringent 40 CFR 265 regulations.

Soil sample results and Olin's NPDES monitoring program are the basis for demonstrating that residual soil concentrations are not impacting environmental media. Although the 1993 soil samples were not collected in the exact locations as the 1985 samples, the data seems to support that the closure was equivalent.

Olin currently operates five (5) groundwater recovery wells and will continue to be regulated by both portions of the state and federally issued RCRA permit. The effectiveness of the groundwater recovery and treatment system will be monitored on a regular basis.

Therefore, I recommend approval of the demonstration report.

Attachments (5)
1. Summary of Samples Collected
2. Appendix VIII Analytical Results (1985 and 1993)
3. Soil Sample Results
4. Horizontal Concentration of Mercury in Groundwater
5. Horizontal Concentration of Chloroform in Groundwater

TABLE 3-1

SUMMARY OF SAMPLES COLLECTED FOR CLEAN CLOSURE EQUIVALENCY DEMONSTRATION

Sample ID	Sample Type	Depth (feet)	Sample Date	Analysis Date				
				Inorganic				
				Cadmium/ Nickel	Mercury	Lead	Semivolatiles	Volatiles
BRINE FILTER BACKWASH POND								
BBF113	Grab	11 - 13	17-Aug-92	8-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	18-Aug-92
BBF120	Grab	18 - 20	17-Aug-92	8-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	18-Aug-92
BBF206	Grab	4 - 6	18-Aug-92	8-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	27-Aug-92
BBF212	Grab	10 - 12	18-Aug-92	8-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	24-Aug-92
MERCURY WASTE PILE STORAGE PAD								
BHG105A[1]	Composite	0.5 - 5	28-Aug-92	8-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	–
BHG105B[1]	Composite	0.5 - 5	02-Sep-92	–	–	–	–	09-Sep-92
POLLUTION ABATEMENT POND								
BPH108	Grab	7 - 8	14-Aug-92	19-Sep-92	10-Sep-92	19-Aug-92	04-Sep-92	17-Aug-92
BPH114	Grab	13 - 14	14-Aug-92	19-Sep-92	10-Sep-92	19-Aug-92	04-Sep-92	17-Aug-92
BPH214	Grab	12 - 14	14-Aug-92	19-Sep-92	10-Sep-92	19-Aug-92	08-Sep-92	17-Aug-92
BPH218	Grab	16 - 18	14-Aug-92	19-Sep-92	10-Sep-92	19-Aug-92	09-Sep-92	17-Aug-92
STORM WATER POND								
BSW114	Grab	12 - 14	28-Aug-92	19-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	29-Aug-92
BSW119	Grab	18 - 19	28-Aug-92	19-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	29-Aug-92
BSW216	Grab	14 - 16	15-Aug-92	19-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	18-Aug-92
BSW216D	Grab	14 - 16	15-Aug-92	19-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	18-Aug-92
BSW222	Grab	20 - 22	15-Aug-92	19-Sep-92	10-Sep-92	16-Sep-92	09-Sep-92	18-Aug-92

NOTES:

– Sample not analyzed for the chemical fraction.

[1] Two borings were required from the same location due to recovery of insufficient sample for the laboratory analyses.

TABLE 3-2

APPENDIX VIII ANALYTICAL RESULTS[1]
1985 AND 1993 GROUNDWATER SAMPLING
(All results in µg/l)

Well Number Dated Sampled	PE-3D 01/29/85	PE-3D 01/06/93	MP-13 01/31/85	MP-13 01/06/93	PH-7D 01/31/85	PH-7D 01/06/93	E-1 06/13/85	E-1 01/06/93	WP-2A 06/13/85	WP-2A 01/06/93	E-2 01/06/93
Appendix VIII and Appendix IX Metals											
Arsenic	–	–	–		12	–	–	–	–	–	–
Barium	20	–	170	–	56	–	410	33	140	700	200
Beryllium	–	–	25	–	13	–	–	–	–	32	–
Cadmium	8	–	7	–	10	–	–	–	–	–	–
Chromium	–	–	10	–	10	–	–	–	–	–	52
Cobalt	NA	250	NA	660	NA	–	NA	–	NA	470	18
Copper	–	–	60	–	70	–	–	–	–	–	21
Lead	–	–	300 (310)[2]	290	200 (240)[2]	–	–	–	–	48	30
Mercury	0.5	1.8	430	65	13	1.8	11	–	–	–	0.24
Nickel	20	–	300	–	100	–	–	–	–	400	24
Selenium	–	–	–(1.0)[3]	–	81 (2.0)[3]	–	–	–	–	–	–
Zinc	90	420	600	1200	500	–	80	–	80	710	80
Volatile Organic Compound											
Benzene	–	–	–	25J	–	–	–	–	25	96J	–
Bromoform	–	7.3J	–	–	–	0.56J	–	–	–	–	–
Bromodichloromethane	–	25J	–	–	–	1.0J	–	–	–	–	–
Chlorobenzene	–	–	–	1000	–	0.7J	–	5.6	461	1400	–
Chloroform	–	190	139	150J	18.6	20	265	9.4	28	88J	–
Dibromochloromethane	–	14J	–	–	–	0.63J	–	–	–	–	–
1,2-dibromo-3-chloropropane	–	–	–	–	23.3	–	–	–	–	–	–
Cis-1,2-Dichloroethene	NA	8.8J	NA	–	NA	–	NA	–	NA	–	–
Methylene chloride	–	–	–	–	11	–	–	7.4	–	–	–
Methyl ethyl ketone	25.1	–	52.1	–	34.1	–	–	–	–	–	–
Trichloroethene	–	6.4J	–	–	–	–	–	–	–	–	–

TABLE 3-2 (Continued)

APPENDIX VIII ANALYTICAL RESULTS
1985 and 1993 GROUNDWATER SAMPLING
(All results in µg/l)

Well Number Dated Sampled	PE-3D 01/29/85	PE-3D 01/06/93	MP-13 01/31/85	MP-13 01/06/93	PH-7D 01/31/85	PH-7D 01/06/93	E-1 06/13/85	E-1 01/06/93	WP-2A 06/13/85	WP-2A 01/06/93	E-2 01/06/93
Semivolatile Organic Compounds											
2-Chlorophenol	–	–	–	–	–	–	–	–	–	2.2J	–
Di-n-butyl phthalate	15.6	–	53	–	38	–	–	–	–	–	–
1,2-Dichlorobenzene	–	300	–	720	–	4.6J	–	10	34.8	1700	–
1,3-Dichlorobenzene	–	–	–	42J	–	1.2J	–	0.61J	2.4	110J	–
1,4-Dichlorobenzene	–	–	–	960	–	4.7J	–	10	48.3	2300	–
2,4-Dichlorophenol	–	–	–	–	–	–	–	–	–	3.2J	–
Pentachlorobenzene	–	4JN	–	2JN	–	6JN	–	–	–	–	–
1,2,4-Trichlorobenzene	–	31	–	9.6J	–	2.6J	–	–	–	74	–
Pesticide/PCBs											
Alpha-BHC	–	–	–	1.3C	–	–	0.75	–	–	3.5C	–
Beta-BHC	–	–	–	0.20J	–	–	–	0.03N	–	–	–
Delta-BHC	–	–	0.058JC	–	–	–	–	–	–	0.30C	–
Gamma-BHC	–	–	–	0.17JC	–	–	0.41	0.021J	–	0.77JC	–
4,4-DDT	–	–	–	0.14J	–	–	–	–	–	–	–

NOTE: Only parameters detected in one or more samples are listed.

Source: October 31, 1991 transmittal of Historical Appendix VIII Analytical Results from Mr. J. C. Brown of Olin to Ms. Joanne Benante of EPA.

1 Also lists constituents reported that are not on 40 CFR 261 Appendix VIII, but are on 40 CFR 264 Appendix IX.
2 Reanalysis by EPA Method 7420.
3 Reanalysis by EPA Method 7741.
J Estimated value.
– Material was analyzed for but not detected.
C Confirmed by GC/MS.
N Presumptive evidence of presence of material.
NA Not analyzed for this parameter.

TABLE 3-5

STORMWATER POND SOIL SAMPLE RESULTS
CLEAN CLOSURE EQUIVALENCY DEMONSTRATION[1]
(Concentrations in mg/kg)

Parameter	BSW114 (12-14 ft)	BSW119 (18-19 ft)	BSW216 (14-16 ft)	BSW216D (14-16 ft)	BSW222 (20-22 ft)
VOLATILES					
BENZENE	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U
CHLOROBENZENE	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U
CHLOROFORM	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U
SEMIVOLATILES					
1,2-DICHLOROBENZENE	0.35 U	0.35 U	0.36 U	0.37 U	0.36 U
1,3-DICHLOROBENZENE	0.35 U	0.35 U	0.36 U	0.37 U	0.36 U
1,4-DICHLOROBENZENE	0.35 U	0.35 U	0.36 U	0.37 U	0.36 U
1,2,4-TRICHLOROBENZENE[2]	0.35 U	0.25 U	0.36 U	0.37 U	0.36 U
HEXACHLOROBENZENE	0.35 U	0.35 U	0.36 U	0.37 U	0.36 U
1,2,4,5-TETRACHLOROBENZENE	0.35 U	0.35 U	0.36 U	0.37 U	0.36 U
INORGANICS					
CADMIUM	0.6 U	0.6 U	0.64 U	0.66 U	0.61 U
LEAD	0.7 J	0.9 J	2.1 J	2.8 J	1.3 J
MERCURY	0.1 U	0.1 U	0.11 U	0.11 U	0.11 U
NICKEL	2.8 U	2.7 U	2.9 U	3 U	2.8 U

NOTES:

1 Sampling dates listed on Table 3-1.

2 The compound 1,2,4-trichlorobenzene is a site-specific constituent as described in Section 3.2.3.1. This parameter was inadvertently omitted from Table 16 of the Phase III SAP (WCC, 1992) and consequently was not reported by the laboratory. The analytical procedure used, however, allows for the identification and quantitation of this compound. After the omission was identified, the laboratory reviewed the analytical data packages and determined that none of the soil samples analyzed for the clean-closure equivalency demonstration contained 1,2,4-trichlorobenzene above the sample quantitation limit. A letter from the analytical laboratory documenting this determination is presented in Appendix F.

U Not detected at or above the quantitation limit shown.

J Matrix spike recovery was outside of control limits. Concentration is estimated.

TABLE 3-6

BRINE FILTER BACKWASH POND SOIL SAMPLE RESULTS CLEAN CLOSURE EQUIVALENCY DEMONSTRATION[1] (Concentrations in mg/kg)

Parameter	BBF113 (11-13 ft)	BBF120 (18-20 ft)	BBF206 (4-6 ft)	BBF212 (10-12 ft)
VOLATILES				
BENZENE	0.011 U	0.01 U	0.012 U	0.012 U
CHLOROBENZENE	0.011 U	0.01 U	0.012 U	0.012 U
CHLOROFORM	0.011 U	0.01 U	0.012 U	0.012 U
SEMIVOLATILES				
1,2-DICHLOROBENZENE	0.36 U	0.34 U	0.4 U	0.4 U
1,3-DICHLOROBENZENE	0.36 U	0.34 U	0.4 U	0.4 U
1,4-DICHLOROBENZENE	0.36 U	0.34 U	0.4 U	0.4 U
1,2,4-TRICHLOROBENZENE[2]	0.36 U	0.34 U	0.4 U	0.4 U
HEXACHLOROBENZENE	0.36 U	0.34 U	0.4 U	0.4 U
1,2,4,5-TETRACHLOROBENZENE	0.36 U	0.34 U	0.4 U	0.4 U
INORGANICS				
CADMIUM	0.64 U	0.6 U	0.69 U	0.69 U
LEAD	4.6 J	0.61 J	8.6 J	9.9 J
MERCURY	0.11 U	0.1 U	0.12 U	0.12 U
NICKEL	2.9 U	2.7 U	3.2 U	3.2 U

NOTES:

[1] Sampling dates listed on Table 3-1.

[2] The compound 1,2,4-trichlorobenzene is a site-specific constituent as described in Section 3.2.3.1. This parameter was inadvertently omitted from Table 16 of the Phase III SAP (WCC, 1992) and consequently was not reported by the laboratory. The analytical procedure used, however, allows for the identification and quantitation of this compound. After the omission was identified, the laboratory reviewed the analytical data packages and determined that none of the soil samples analyzed for the clean-closure equivalency demonstration contained 1,2,4-trichlorobenzene above the sample quantitation limit. A letter from the analytical laboratory documenting this determination is presented in Appendix F.

U Not detected at or above the quantitation limit shown.

J Matrix spike recovery was outside of control limits. Concentration is estimated.

TABLE 3-7

POLLUTION ABATEMENT (pH) POND SOIL SAMPLE RESULTS CLEAN CLOSURE EQUIVALENCY DEMONSTRATION[1] (Concentrations in mg/kg)

Parameter	BPH106 (7-8 ft)	BPH114 (13-14 ft)	BPH214 (12-14 ft)	BPH218 (16-18 ft)
VOLATILES				
BENZENE	0.012 U	0.01 U	0.012 U	0.01 U
CHLOROBENZENE	0.012 U	0.01 U	0.012 U	0.01 U
CHLOROFORM	0.012 U	0.01 U	0.002 J[1]	0.01 U
SEMIVOLATILES				
1,2-DICHLOROBENZENE	0.4 U	0.34 U	0.4 U	0.35 U
1,3-DICHLOROBENZENE	0.4 U	0.34 U	0.4 U	0.35 U
1,4-DICHLOROBENZENE	0.4 U	0.34 U	0.4 U	0.35 U
1,2,4-TRICHLOROBENZENE[2]	0.4 U	0.34 U	0.4 U	0.35 U
HEXACHLOROBENZENE	0.4 U	0.34 U	0.4 U	0.35 U
1,2,4,5-TETRACHLOROBENZENE	0.4 U	0.34 U	0.4 U	0.35 U
INORGANICS				
CADMIUM	0.69 U	0.6 U	0.65 U	0.63 U
LEAD	5.5 J[2]	0.74 J[2]	4.0 J[2]	0.67 J[2]
MERCURY	0.12 U	0.1 U	0.11 U	0.11 U
NICKEL	3.2 U	2.8 U	3.0 U	2.9 U

NOTES:

1 Sampling dates listed on Table 3-1.

2 The compound 1,2,4-trichlorobenzene is a site-specific constituent as described in Section 3.2.3.1. This parameter was inadvertently omitted from Table 16 of the Phase III SAP (WCC, 1992) and consequently was not reported by the laboratory. The analytical procedure used, however, allows for the identification and quantitation of this compound. After the omission was identified, the laboratory reviewed the analytical data packages and determined that none of the soil samples analyzed for the clean-closure equivalency demonstration contained 1,2,4-trichlorobenzene above the sample quantitation limit. A letter from the analytical laboratory documenting this determination is presented in Appendix F.

U Not detected at or above the quantitation limit shown.

J[1] Estimated concentration below the quantitation limit.

J[2] Matrix spike recovery outside control limits. Concentration estimated.

TABLE 3-8

MERCURY WASTE PILE STORAGE PAD SOIL SAMPLE RESULTS CLEAN CLOSURE EQUIVALENCY DEMONSTRATION[1] (Concentrations in mg/kg)

Parameter	BHG105A (0.5-5 ft)	BHG105B (0.5-5 ft)
VOLATILES		
BENZENE	—	0.012 U
CHLOROBENZENE	—	0.012 U
CHLOROFORM	—	0.012 U
SEMIVOLATILES		
1,2-DICHLOROBENZENE	0.44 U	—
1,3-DICHLOROBENZENE	0.44 U	—
1,4-DICHLOROBENZENE	0.44 U	—
1,2,4-TRICHLOROBENZENE[2]	0.44 U	—
HEXACHLOROBENZENE	0.44 U	—
1,2,4,5-TETRACHLOROBENZENE	0.44 U	—
INORGANICS		
CADMIUM	0.76 U	—
LEAD	11.3 J	—
MERCURY	1.1	—
NICKEL	3.5 U	—

NOTES:

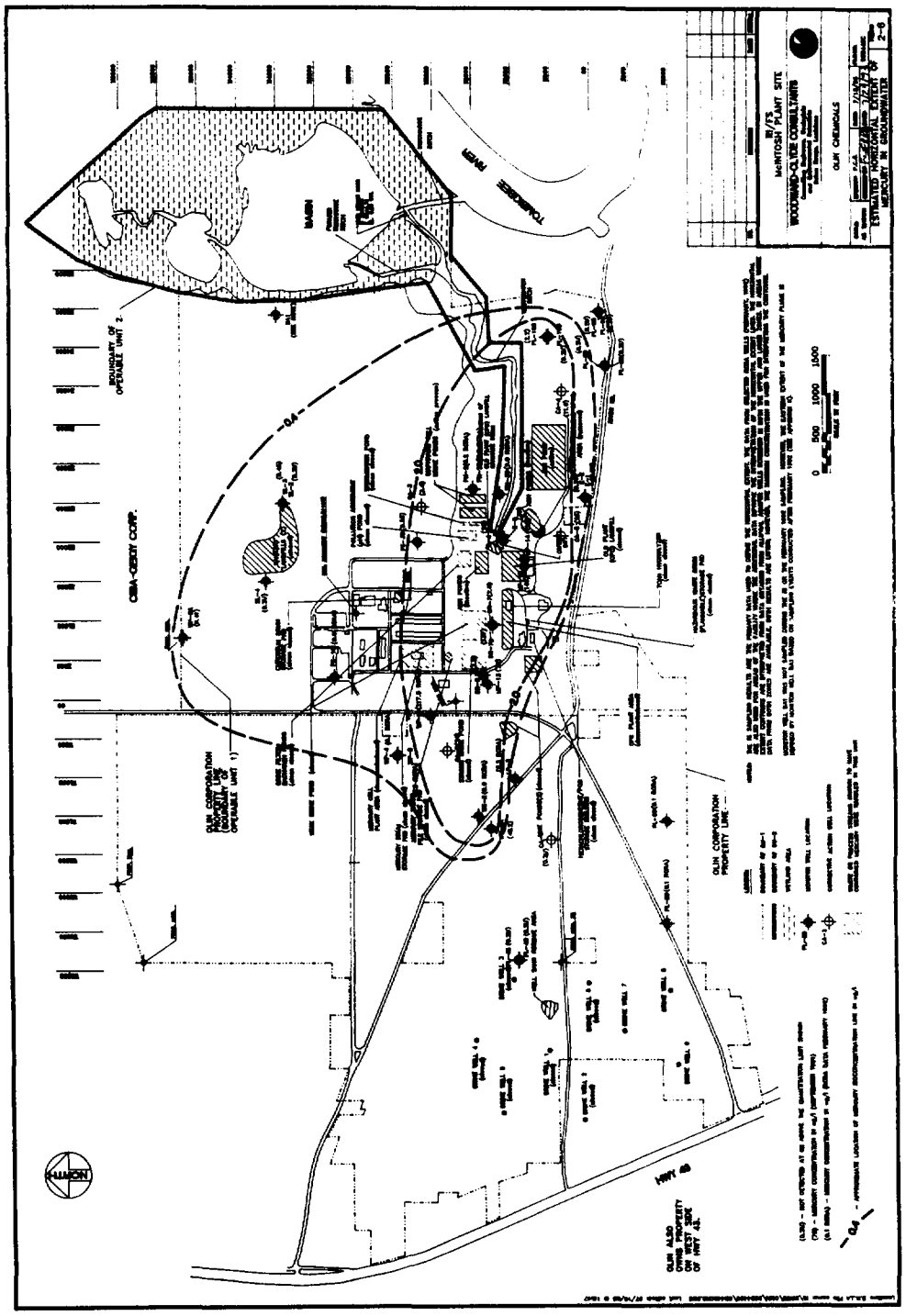
1 Sampling dates listed on Table 3-1.

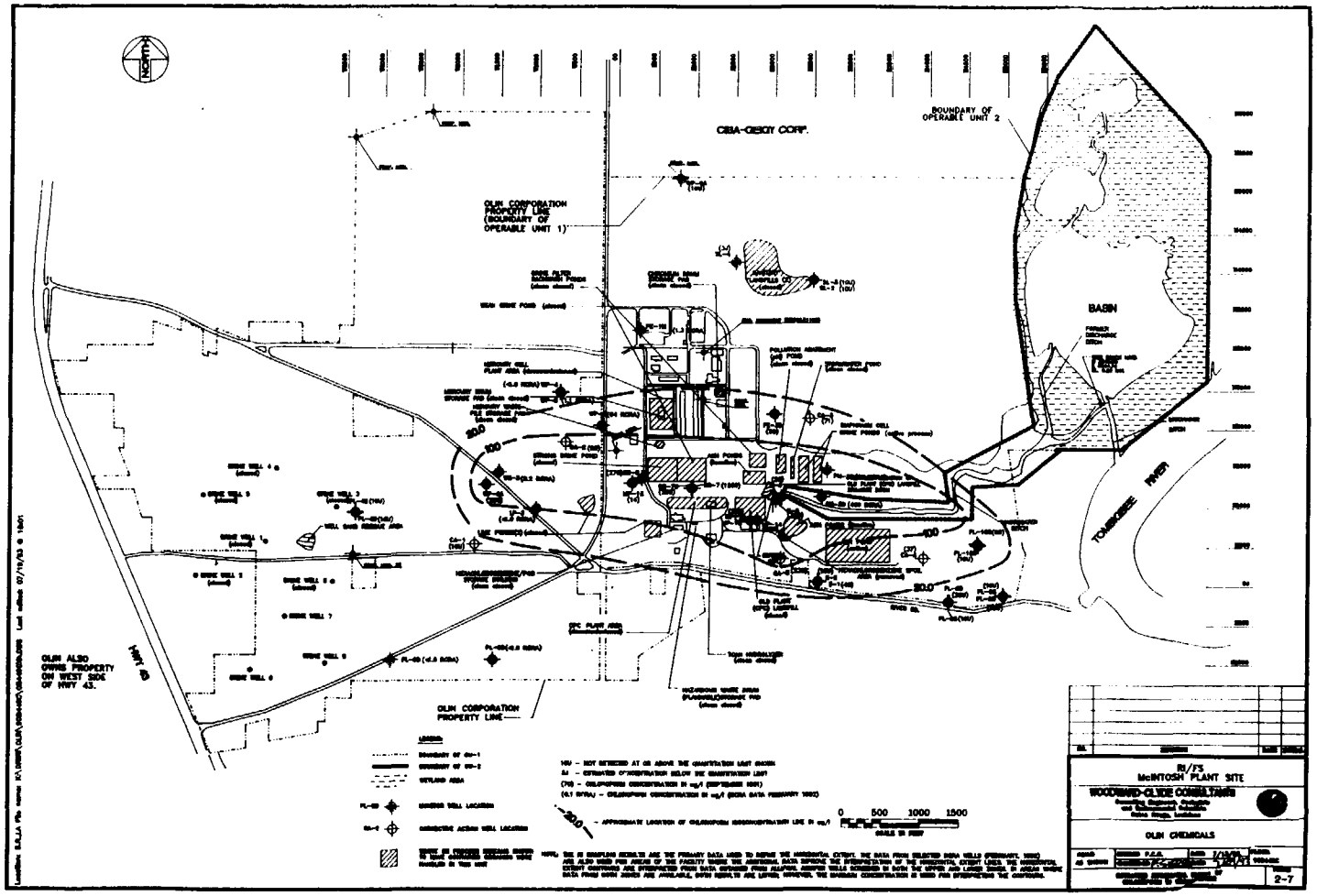
2 The compound 1,2,4-trichlorobenzene is a site-specific constituent as described in Section 3.2.3.1. This parameter was inadvertently omitted from Table 16 of the Phase III SAP (WCC, 1992) and consequently was not reported by the laboratory. The analytical procedure used, however, allows for the identification and quantitation of this compound. After the omission was identified, the laboratory reviewed the analytical data packages and determined that none of the soil samples analyzed for the clean-closure equivalency demonstration contained 1,2,4-trichlorobenzene above the sample quantitation limit. A letter from the analytical laboratory documenting this determination is presented in Appendix F.

U Not detected at or above the quantitation limit shown.

J Matrix spike recovery was outside of control limits. Concentration is estimated.

— Sample not analyzed for this parameter.


W/R
MANTOSH PLANT SITE
WOODWARD-CLYDE CONSULTANTS
OLIN CHEMICALS
ESTIMATED HORIZONTAL EXTENT OF MERCURY IN GROUNDWATER
OLIN CORPORATION PROPERTY LINE
CIBA-GEIGY CORP.
BOUNDARY OF OPERABLE UNIT 2
OLIN CORPORATION PROPERTY LINE OPERABLE UNIT 1
MAIN
TOMHANNOCK CREEK
HWY 49
OLIN ALSO OWNS PROPERTY ON THIS SIDE OF HWY 49
0
500
1000
1500


NORTH
CIBA-GEIGY CORP.
BOUNDARY OF OPERABLE UNIT 2
OLIN CORPORATION PROPERTY LINE (BOUNDARY OF OPERABLE UNIT 1)
BASIN
TOMBIGBEE RIVER
OLIN OWNS PROPERTY ON WEST SIDE OF HWY 43.
HWY 43
OLIN CORPORATION PROPERTY LINE
R/FS
McINTOSH PLANT SITE
WOODWARD-CLYDE CONSULTANTS
OLIN CHEMICALS
2-7